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Title: Sol-Gel Processing of Li5La3Ta2O12 for Transparent Ceramic Scintillators

Author(s): Smith, Joshua Paul
Chen, Ching-Fong
Capelli, Deanna

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Sol-Gel Processing of $Li_5La_3Ta_2O_{12}$ for Transparent Ceramic Scintillators

Josh Smith[1,2], Deanna Capelli[1], Chris Chen[1]

[1]Los Alamos National Laboratory

Sigma Division

Powder Materials Processing

[2]The University of Tennessee Knoxville

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Summer Fun

Josh Smith (Sigma)

- Educational Background
  - o BS in Nuclear Engineering Texas A&M University, 2016
  - o MS/PhD student. The University of Tennessee Knoxville, 2021
- Sigma
  - o Powder Materials Processing
  - o Chris Chen
- Research
  - o Sol-Gel Processing of $Li_5La_3Ta_2O_{12}$ for Transparent Ceramic Scintillators
  - o Synthesis and Characterization of Ceramic Scintillators

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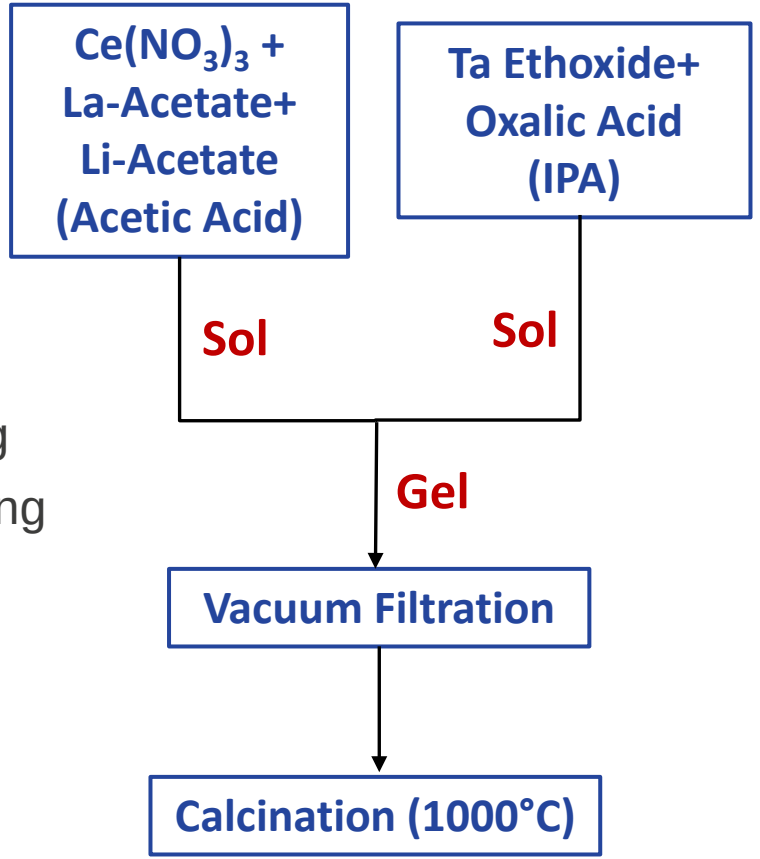
Research Overview and Motivation

- **Scintillators for Radiation Detection for Nuclear Security Applications**
- **Ceramic Scintillators**
  - Alternative to single crystal growth
- **$Li_5La_3Ta_2O_{12}$**
  - Dual purpose detection material (n and γ)
  - $Li^6(n, \alpha)H^3$ – Pulse Shape Discrimination
- **Nano-particles**
  - Lower sintering temperatures
  - Decreased residual pore size, increased transmission
- **Sol-Gel Method**
  - High-purity, flexible composition possible
  - Scalable production method

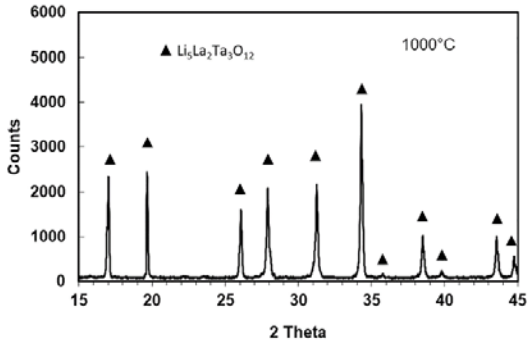
Research Approach

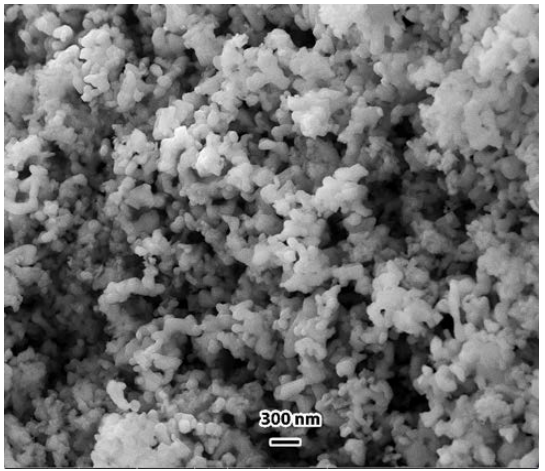
- **Nano-particle Synthesis**
  - Produced vis Sol-Gel process
  - Characterized using XRD and SEM
- **Ceramic Synthesis**
  - Closed porosity achieved by hot pressing
  - Final densification by hot-isostatic pressing
  - Characterize by XRD and SEM



Summary of Results

- **Nano-particle Synthesis**
  - o XRD confirmed cubic $Li_5La_3Ta_2O_{12}$ belonging to space group $Ia\bar{3}d$
  - o SEM showed agglomerated particles with an average size of ~150 nm
- **Ceramic Synthesis**
  - o Hot pressing in progress
  - o Hot isostatic pressing will completed after
- **Other Compositions**
  - o BaF_2





$Li_5La_3Ta_2O_{12}$ ~150 nm